93-00601/

CANADIAN URBAN INSTITUTE

Activities Related to the Prevention of Climatic Change in some Major Urban Areas of North America

CANADIAN URBAN INSTITUTE INSTITUTE L'INSTITUT URBAIN DU CANADA

Working Paper Series WP-3

Canadian Urban Institute, 1991

WP-3 Activities Related to the Prevention of Climatic Change in some Major Urban Areas of North America

Project Manager: Richard Gilbert

Canadian Urban Institute Working Papers are provided to interested individuals and agencies without charge when single copies are ordered. The Institute welcomes suggestions and comments on Working Papers as these papers may be considered for publication in the *Urban Focus Series*.

ACTIVITIES RELATED TO THE PREVENTION OF CLIMATIC CHANGE IN SOME MAJOR URBAN AREAS OF NORTH AMERICA[1]

Richard Gilbert[2]

CONTENTS:

The need for action 1

What will happen if we don't stop global warming 5

What is being done with respect to climate change in five North American urban regions:

Chicago 7
Los Angeles 8
Montreal 11
New York 12
Toronto 12

Concluding comments 15

NOTES (1-67) 18

SOURCES CITED IN THE NOTES 26

This paper is in four parts. The first part provides a perspective on the need for action to prevent and prepare for global warming. The second part summarizes potential consequences of inaction on communities in North America. The third part provides notes on what is happening (or not happening) with respect to global warming in five North American urban regions from the perspective of local and regional government. Two of the regions are in Canada; three are in the United States.

The concluding part suggests explanations for the apparent indifference of most local government agencies in the five urban regions to the matter of global warming and continues with a brief discussion as to whether intensive urbanization is a positive or negative factor in the quest to sustain a habitable planet. I conclude that such settlement patterns are more a solution than a problem, given the explosive human population and the ready access to fossil-fuel-based personal transportation. But the widespread unwillingness to take early appropriate action to avert global warming, or even prepare for it, is making questions such as the one about urbanization increasingly academic.

THE NEED FOR ACTION

At the 1990 World Climate Conference,[3] unsuccessful attempts were made to have the industrialized countries agree to stabilize their emissions of heat-trapping gases into the atmosphere by the year 2000, and perhaps to reduce emissions by 20 per cent below 1988 levels by 2005.

But the scientific report before the conference suggested that even a cut by 20 per cent would do little to prevent a potentially catastrophic increase in the average temperature of our planet's surface. The report, published in May, was the work of over 300 of the world's most eminent climatologists and atmospheric scientists.[4] Their work supported the following points:

- Human activity, mostly the burning of fossil fuels, has already changed the atmosphere enough to cause an unprecedented increase in global temperatures during the next few decades.[5]

- Continuation of present rates of emission of carbon dioxide, methane, chlorofluorocarbons (CFCs), nitrous oxide, and other radiatively active gases could raise temperatures to levels at which life as we know it cannot exist.[6]

- Stopping global warming will require cuts of some 70 per cent or more in the total emissions of most of these gases, notably carbon dioxide. The

planet's various systems for absorbing carbon dioxide can cope with no more than 30 per cent of what is presently produced by human activity.[7]

- Even slowing global warming enough for ecosystems, particularly forests, to adapt or migrate will require reductions in total emissions by 50 per cent or more.[8]

Rarely has there been such consensus in the scientific community about a controversial matter. The few sceptics have received a disproportionate amount of attention in the media; they are generally unqualified in relevant areas of scientific expertise.[9]

The task before industrialized countries may be even greater than that of achieving cuts of 50 or 70 per cent in emissions – on account of rapid population growth in the developing world.

Table 1 shows overall and per capita carbon dioxide emissions from the use of fossil fuels in 1950 (when overall use was 70 per cent below the 1988 level) and in 1988. It also sets out four scenarios for the year 2005:

- **Scenario A:** *Present trends continue.* Carbon dioxide emissions continue to rise at the rate of 1% a year in First World countries, 2% in Second World countries (together the industrialized or "have" countries), and 5% in Third World (the developing or "have-not") countries.[10]

- **Scenario B:** *The have countries achieve the target set at the 1988 conference on The Changing Atmosphere in Toronto.*[11] Their carbon dioxide emissions are cut by 20% by 2005. Emissions in the have-not countries continue to rise at the present rate of 5% a year.

- **Scenario C:** *The Toronto Conference target of a 20% reduction in carbon dioxide emissions is met overall.* This is done by (i) allowing no increase in per-capita emissions in the have-not countries, and (ii) reducing per-capita emissions in the have countries to just below 1950 levels.

- **Scenario D:** *The 70% overall reduction in carbon dioxide emissions needed to prevent global warming is achieved.* Furthermore, per-capita carbon dioxide emissions in the have and the have-not countries are equalized.

The estimates in Table 1 are based in part on the population data and projections in Table 2. The projections assume increases of 0.6% a year in the have countries between 1988 and 2005 and 1.8% a year in the have-not countries in the same period.[12]

Table 1. Carbon Dioxide Levels, 1950-2005.

Year	Scenario (see text for details)	Billions of tonnes of carbon dioxide into the air from fossil fuels			Percentage difference of total from 1988	Tonnes of carbon dioxide into the air per person	
		Haves	Have-nots	Total		Haves	Have-nots
1950	(Actual)	5.6	0.6	6.1	-70	6.6	0.3
1988	(Actual)	14.5	5.9	20.4	0	12.1	1.5
2005	A	18.2	13.4	31.6	+55	13.7	2.6
2005	B	12.1	13.4	25.5	+25	9.3	2.6
2005	C	8.3	7.9	16.2	-20	6.2	1.5
2005	D	1.2	4.9	6.1	-70	0.9	0.9

Table 2. World population and projections, 1950-2005

Year	Population (billions)		
	Haves	Have-nots	Total
1950	0.9	1.7	2.6
1988	1.2	3.9	5.0
2005	1.3	5.2	6.5

In the above two tables:

"Haves" refer to the First World (industrialized, market economy) countries *and* the Second World (industrialized, command economy but changing) countries.

"Have-nots" refer to the Third World (industrializing or developing) countries.

The key conclusion from Table 1 is this: If further global warming has been stopped by 2005 (beyond what will have already been committed) because overall carbon dioxide emissions have been cut to 30 per cent of 1988 levels (i.e., back to what they were in 1950), each person in the world will then be responsible for emitting an average of only 0.9 tonnes a year, directly or indirectly. To achieve this rate, *emissions per person in industrialized countries will have to be cut by more than 90 per cent.* In developing countries the cut per person will have to be by 40 per cent, unless by then developing countries are responsible for *more* emissions per capita than industrialized countries.

Similar calculations to those used to create Table 1 indicate that to achieve the reduction by 50 per cent needed to reduce global warming to a tolerable level, average emissions of carbon dioxide per person from fossil fuels must fall to less than 1.6 tonnes per year. This will require a cut of more than 85% for people in industrialized countries; it would allow an increase in emissions of no more than 5% for people in developing countries unless, again, developing countries are responsible for more emissions per capita than industrialized countries.

Confronted with this kind of analysis, and the seeming impossibility of averting catastrophe, an official of the European Community was reported as saying "If the scientific panel is right, then we are on the *Titanic*, and the only question that remains is whether we go first class or steerage. I prefer first class."[13]

The official's cynical despair is unwarranted: a 90 per cent reduction in emissions could be achieved without returning to the general discomfort of a pre-industrial society.

Cuts in fossil fuel use of some 90 per cent can be achieved in the three major areas of consumption – transportation, industry, and heating, lighting, and cooling buildings. (World-wide, each accounts for roughly a third of total use of fossil fuels – with transportation accounting for somewhat less than the other two.[14])

A cut in fossil fuel use of more than 90 per cent can be achieved by switching to the most efficient forms of public transit, which generate less than 10 per cent of the carbon dioxide produced per passenger-kilometre than travel by automobile.[15] Industry, by improvements in efficiency and greater use of renewable energy, could cut its consumption of fossil fuels by 90 per cent and be more productive than at present.[16] Buildings in most climates can be built or converted to require only 10 per cent of the fossil fuel energy currently used for heating and cooling.[17]

What is required to achieve these things is widespread awareness of the nature of our global predicament, and sufficient popular and political will.

The notion that a 20 per cent cut in emissions is enough for the moment came out of the conference on The Changing Atmosphere held in Toronto in 1988. The need for much larger cuts was recognized, but participants felt a 20 per cent cut was all that could be called for. Setting such a low target was a mistake. It suggests that only small changes in the way we go about our lives are required; its apparent modesty encourages dissenters. If the need for early massive cuts in fossil fuel use had been trumpeted out loud, the actions required to preserve life on our planet might now be more widely accepted.

The scientific community is divided as to whether the increases in average temperatures during the past 100 years are evidence that global warming due to human activity has already begun. Some scientists believe the occurrence of the five hottest years in recorded history during the 1980s was an indication of such global warming. Others wait for more data.[18]

Reports from monitoring stations around the world suggest that 1990 will be the hottest year of all. Moreover, what may be first evidence of ecological damage from global warming has been noted: widespread bleaching and death of coral reefs throughout the tropics.[19]

WHAT WILL HAPPEN IF WE DON'T STOP GLOBAL WARMING

At the beginning of the previous section I mentioned the possibility of a "potentially catastrophic increase in the average temperature of our planet's surface." This section touches briefly on the nature of the possible catastrophe, as it might be experienced in some of North America's major urban areas.

- **Saltwater inundation.** Rising temperatures will cause glaciers to melt and water in the oceans to expand, raising sea levels by a best estimate of 200 millimetres by 2030 and one metre by 2100, if nothing is done to check global warming.[20] Affected would be coastal cities and cities such as Montreal that are on tidal rivers. As well as flooding, there could be problems at water inlets and sewage outlets, and from contamination of the water table.

- **Damage to infrastructure.** Much infrastructure is climate specific, as to both temperature and precipitation. Substantial changes could cause early or

long-term damage in building foundations, bridge supports, sewer mains, and other elements.

- **Over-stressed transit.** Rising temperatures may cause alarm about the use of fossil fuels and lead to action to curb their use, and thereby enhance demand for public transit, probably beyond the capacity of systems to accommodate the demand.

- **Inappropriate energy infrastructure**. Rising temperatures will reduce the need for heating and increase the need for cooling, thus altering patterns of energy demand and likely necessitating major investments in supply. Also, the eventual alarm about the use of fossil fuels will provide imperatives to structure energy supplies.

- **Mass unemployment.** If use of the private automobile diminishes, there will be enormous dislocation of North America's automobile-based economy, resulting in much unemployment.

- **Ecological refugees.** The possibility that rising temperatures will desiccate the middle of the North American continent has been described as "one of the most definite predictions that our numerical models have given us."[21] The desiccation will occur both because rainfall will decline and because greater summer heat causes more evaporation from the soil.[22] As well as affecting the Chicago region directly, and playing havoc with water tables and underground systems, the desiccation could cause much of the Midwest to become a desert, producing millions of ecological refugees who would flee to less affected places. The Toronto region could be especially attractive to refugees from the Midwest. It sits by a huge body of fresh water and is distant from the direct effects of sea-level change.

- **Food shortages.** As temperatures increase, the usual sources of food supply for North Americans will experience local disruption, but beneficial effects of climate change in other areas will likely mean that there will be enough food produced.[23] Whether this food will reach distant cities is another matter. Shortages of and restrictions upon the use of fossil fuels will exacerbate the problems of establishing transportation links to new sources of supply. Urban residents will not generally be able to turn to local sources for their food. Most urban centres in North America are located on or close to land suitable for intense cultivation, land that is now covered with sprawling residential and commercial development.

Occurrence of just one or two of these potential outcomes of global warming would be a catastrophe. All are possible. None is being given serious consideration.

WHAT IS BEING DONE WITH RESPECT TO CLIMATE CHANGE IN FIVE NORTH AMERICAN URBAN REGIONS.

The urban regions considered here are Chicago, Los Angeles, Montreal, New York, and Toronto, in that order.

Chicago

The Chicago region, according to the title of a series in the Chicago Tribune in February this year,[24] is "Choking on growth." A subsequent editorial commented, "This region is strangling on its own success, nowhere more than in the suburbs. ... Because of the irregular sprawl connecting one suburb to another, it's been almost essential to drive between them. The densities are too great to accommodate this comfortably but not great enough to encourage mass transportation. Virtually nothing is within walking distance. And there is something about the suburban psyche that is resolutely fixed on the automobile." The editorial concluded by noting that "The idea of some kind of regional or county authority to oversee planning for orderly growth and its traffic impact is as obvious as it has been a joke ... [it] will not happen until today's frustration worsens into tomorrow's desperation."

The series indicated the utter dependence of the vast majority of the 8 million residents of the Chicago region on their automobiles, and the near impossibility of achieving a reduction in this dependence. The predicament and attitudes were confirmed during a series of meetings in July with officials in the region. "Gridlock is preferred to more government" was one comment.[25]

The concern about automobile use in the Chicago region, such as it is, is mostly concern about congestion. According to one official, "There is no one working on global warming in Chicago." Another said, "There is a great mistrust in Chicago of experts on climate and on the level of Lake Michigan."[26]

I spoke with regional and local planners about the prospects of concentration within the central part of the region (the City of Chicago) – concentration that might make public transit more accessible for larger numbers of people. I was told that the population of the City of Chicago has been stable at three million since 1980 (down from a peak of 3.6 million in 1950) and that increases in density above three million "are not what people want."[27]

"Chicago," said Elizabeth Hollander, former Commissioner of planning for the city, "is in many ways a case study of how not to do it."[28]

Los Angeles

A significant difference between Los Angeles and Chicago is that there is less concern among officials with what people want and more concern with the environmental consequences of people doing what they want.

The focus of reducing the impact on the atmosphere of human activity in the Los Angeles region is the South Coast Air Quality Management District (SCAQMD), a statutory authority established by the California State Legislature in 1967 from the Air Quality Management offices of four counties. This authority is large (US$82 million annual budget, some 1,000 employees, and jurisdiction over an area of greater than 33,000 square kilometres) and powerful (fines of up to US$25,000 per day for each violation of its rules). Its power is much resented.[29] But SCAQMD doesn't like to appear to be "doing it to the public." Its posture is rather one of "we're all in this together."[30]

What they are all in together, precisely, is the worst urban environment in the United States. Federal air quality standards were exceeded on 157 days in 1989, including 54 so-called "episode days" when the air was considered "very unhealthful."[31]

The work of SCAQMD is chiefly directed towards meeting the federal air quality standards. But in the course of this work, there is growing concern for the global environment.

In April 1990, SCAQMD adopted a policy on global warming and stratospheric ozone depletion. The policy notes that SCAQMD's programs are directed primarily towards reducing emissions in violation of state and federal standards. Global warming should be addressed too, continues the preamble to the policy, both because it will impair SCAQMD's ability to meet the standards and because SCAQMD and the Los Angeles region's residents "have historically exercised leadership in recognizing and coping with the threats posed by air pollution of all kinds." The policy states that SCAQMD will henceforth act to reduce both criteria pollutants and emissions that cause global environmental damage. Adoption of the policy introduced new emphases in SCAQMD's work on carbon dioxide and methane, and reinforced previous emphases on CFCs and HCFCs. It is to "provide direction for" the 1991 revision of SCAQMD's Air Quality Management Plan.

According to a SCAQMD official, emission of CFCs in the Los Angeles region make a greater contribution to global warming than carbon dioxide emissions in the region.[32] No data were given, but the evidently ubiquitous

air conditioning of the 8 million cars and trucks,[33] and every building, and the high concentration of industry that may use CFCs for such processes as the blowing of foam, make the statement seem plausible.[34]

Reduction of emissions of CFCs in the Los Angeles region has also been a concern of local government. Led by the City of Los Angeles, several cities have passed ordinances regulating the use of disposable plastic foam products made with CFCs.[35] The Los Angeles ordinance, adopted in September 1988 and strengthened in February 1989, appears to be directed more towards the reduction of CFC emissions to mitigate depletion of the ozone layer rather than to contribute to the prevention of global warming.[36]

The calculation of relative contributions does not seem to have been made but it seems likely that the automobile, chiefly through emissions of carbon dioxide and CFCs, is the source making the greatest contribution to the enhanced greenhouse effect in the Los Angeles region.

SCAQMD is deeply concerned to reduce automobile use, mostly on account of the contribution of its emissions to smog. Its 1989 Air Quality Management Plan includes 20 control measures to lower automobile and truck emissions by reducing vehicle use. They include transit improvements, alternative work schedules, telecommuting, improvements in traffic flow, banning of new drive-through facilities, and growth management.[37]

The contribution of growth management to reducing vehicle emissions, according to SCAQMD,[38] lies chiefly in locating businesses and homes close together in new subregional centres in order to reduce vehicle use. A recent example of this, known as the Porter Ranch development, has been unsuccessful, however. Million-dollar homes were mixed with mostly low-income jobs, doing little to reduce commute times. The new location for the headquarters of SCAQMD, the Diamond Bar facility, was chosen to reduce average commute times for the 1,100 employees who will work there when it opens in 1991.

Generally speaking, land use management of this kind, and indeed most of the other control measures designed to reduce vehicle use, are under the control of other agencies in the Los Angeles area, often local governments. The agency SCAQMD works with most closely, particularly on transportation and land use issues, is the Southern California Association of Governments (SCAG).

SCAG is a voluntary association of some 150 of the 175 cities and counties in the region, which has a total population of some 14 million, due to rise to 18.3 million by 2010.[39] SCAG is the state authority for the preparation of regional plans, but has achieved its real control through its

status as the allocator of what are now diminishing state and federal funds for transportation and other projects.

According to officials of SCAG, the Association is encouraging local authorities to achieve a jobs-housing balance in the region. SCAG is also promoting experimentation with abolishing zoning to achieve an intimate mix of land uses. A specific objective is to achieve 1.2 jobs per housing unit in each new development. The broader objective is to locate 5 per cent of new housing close to 9 per cent of new jobs by 2010 to reduce vehicle-kilometres travelled per day by some 53 million.

This reduction may sound impressive, but it should be set against current total kilometres travelled in the region per day and the anticipated total in 2010 if nothing is done. These totals are 354 million and 602 million respectively. Thus the measures to achieve a jobs-housing balance will reduce the increase in vehicle-kilometres from 70 per cent to 55 per cent.

The over-riding objective seems to be to restore the 1984 average peak-period highway speed of 56 km/h. The average speed will decline to 30 km/h by 2010 if nothing is done. The salient virtue of achieving the proposed jobs-housing balance, according to SCAG officials, is that it will reduce infrastructure costs required to restore and sustain the 1984 average highway speed from US$110 billion to US$44 billion.

When asked whether the eventual phasing out of the private automobile in the Los Angeles region is conceivable, to reduce fossil fuel use enough to avert global warming, SCAG officials replied that it would not be politically acceptable on account of people's economic needs. Something will have to be found to replace the present automobile, such as electric vehicles charged by power from nuclear reactors.

The 1989 Air Quality Management Plan of SCAG and SCAQMD speaks to the use of "extremely low emitting vehicles," possibly powered by electricity, as a final step in achieving compliance with federal air quality standards by the year 2007. The Plan also goes on to note that if electric vehicles are used to meet the standards, an additional 9,200 megawatts of generating capacity will be required by 2007, i.e., more than nine 1,000-megawatt reactors.[40]

Centralization in any form is also inconceivable. Reference was made to a local 1978 study of urban forms in which concentration came out slightly worse than spread: transit use increased with concentration, but so did congestion. Presently only 5 per cent of jobs are in the downtown area.[41]

In summary, the Los Angeles region probably provides the largest contribution to the enhanced greenhouse effect of any urban region in the

world. It may also contain, in SCAQMD, the most sophisticated institutional understanding of and response to air pollution problems, including problems of a global nature. Nevertheless, the collective response seems to be to attempt only modest attenuation of trends towards substantial increases in fossil fuel use, buttressed by hope that nuclear or other sources of electricity will become available.[42]

The collective lack of concern for the form of the region was evidenced in the much-publicized environmental initiative known as Proposition 128, and also as Big Green, which spoke to reducing carbon dioxide emissions but not to reversing the sprawl of the Los Angeles and other urban regions in California.[43] Big Green, which was mostly a device to limit the use of agricultural pesticides, was defeated 2-1 at the ballot box in November.

Montreal

In April 1990, the City of Montreal's planning department issued an impressive list of 98 environmental initiatives being undertaken by the City.[44] None of them appears to be specifically directed towards prevention of global warming. Some – energy conservation, for example – would nevertheless help. Others – use of natural gas as a vehicle fuel, for example – might add to the greenhouse effect.[45]

The Montreal Urban Community, which includes the City of Montreal and embraces the 500 or so square kilometres of Montreal Island and some smaller islands, adopted a regional land-use plan in 1987 that includes many elements compatible with the prevention of global warming. It speaks to consolidating development as a continuation of the existing urban fabric, to promoting higher density development close to existing infrastructure, to establishing multifunctional activities in subcentres, and, above all, to revitalizing the central zone around the downtown. All of these aims, if implemented, could help enhance the viability of public transportation. However, planned transportation infrastructure seems heavily weighted towards the automobile.[46]

Although the population of the Montreal region has been growing, that of the Montreal Urban Community has been declining.[47] The growth in population has been in the areas adjacent to Montreal Island, sprawling far from the centres of employment. The more than a million residents of these areas, plus many on Montreal Island itself, live at low or very low densities and are as dependent on their automobiles as the typical resident of Los Angeles or the suburbs of Chicago. There seems to be little concern to counter the sprawl and thus to reduce emissions of radiatively active gases.

A senior official of the Montreal Urban Community said to me that there is no one in his administration or that of the City of Montreal who has a special concern about global warming.[48]

New York

New York, too, seems almost oblivious to global warming. The chief threat is rising sea level. A sub-committee of a task force on coastal areas under the direction of the state Lieutenant-Governor is to look at the effects of possible sea-level rise on sewage management, low-lying airports, and coastal structures, among other things.[49]

During her introduction to the session on The Greenhouse Effect and Ozone Depletion at a conference at the United Nations Headquarters in September,[50] Ruth Messinger, President of the Borough of Manhattan, described New York City's efforts only in terms of local air pollution and avoidance of ozone depletion. Much was made of the proposed conversion of 24,000 municipal vehicles to run on natural gas. This is being done (together with conversions to run on methanol) to avoid stiffer obligations that might be imposed by the federal Environmental Protection Agency to reduce local air pollution.[51] As noted earlier in the case of Montreal, use of natural gas as a vehicle fuel may add to the greenhouse effect.[52]

I asked the director of Marine Sciences Research at the State University, Stoneybrook, what is being done in the New York City region about global warming. He replied, "It's more a question of what is not being done."[53]

Toronto

Toronto has been singled out among cities as a "progressive oasis" in the matter of global warming in that it is aiming for carbon dioxide cuts by the end of the century.[54] But this promise may not be fulfilled.

The favourable identification of Toronto was the result of a resolution adopted by the City of Toronto Council[55] in January 1990 that committed the City to reducing its net carbon dioxide emissions by 20 per cent from 1988 levels by the year 2005 – i.e., the initial global target set at the conference entitled The Changing Atmosphere, held in Toronto and mentioned in the first part of this paper.[56] Adoption of the resolution by Toronto City Council was recommended by the Council's Special Advisory Committee on the Environment, a blue-ribbon committee of scientists and other experts. The Committee was established soon after the 1988 conference. It made its first report in October 1989 under the title *The Changing Atmosphere: A Call to Action*.

The reduction in carbon dioxide emissions was to be achieved not just within the civic administration but throughout the city, taking into account all activities by residents and visitors. It was to be secured through a combination of direct reduction of emissions and an "offsetting carbon sink" created through reforestation in Southern Ontario and Central America.

Because of uncertainty about the jurisdictional ability of City Council to achieve direct a reduction in emissions,[57] the carbon sink was to be large enough to offset the full target of a 20 per cent reduction. To create the sink, the sum of $23 million was set aside – part of the proceeds of the sale of mostly rural land near the city that had been sold for development by an earlier Council. (None of this money had been spent by the end of 1990.)

Notwithstanding the jurisdictional uncertainty, emissions reductions were part of the program. Work was initiated to secure, among other things, the following:

- expansion of the district heating system and the introduction of district cooling based on cold water drawn from the depths of Lake Ontario – a renewable source of coolant[58]
- traffic calming and reduction in emissions from vehicles
- a substantial increase in the energy efficiency of buildings constructed by the City's own housing corporation
- establishment of an Energy Efficiency Office to advocate and secure reductions in fossil fuel use.[59]

There has been no evaluation of progress during 1990, but one is expected before August 1991 when the City of Toronto will host a major international conference to be known as World Cities and the Environment.[60]

Even before the establishment of the Special Advisory Committee on the Environment, Toronto City Council had responded to The Changing Atmosphere conference in Toronto in 1988 by initiating a trial program to recover CFCs from discarded household refrigerators and freezers. This program is about to be abandoned on the grounds that only 335 (13%) of the 2,602 units collected during the first eight months of the program were found to contain measurable quantities of coolant; in the remainder it had already escaped.[61]

The Special Advisory Committee on the Environment is preparing to release its second report early in 1991. The thrust of this report will be that if

City Council takes appropriate action the target for 2005 can be achieved by reductions in emissions throughout the city, whether or not the Council prevails successfully upon other levels of government and other agencies, public and private, to act in concert with its initiatives. The Committee no longer doubts the adequacy of the City Council's authority to achieve reductions in emissions.

Establishment of the carbon sink will continue to be recommended, but not so much to offset carbon dioxide emissions in Toronto as to compensate for the massive deforestation that occurred during the settlement of the Toronto region in the eighteenth and nineteenth centuries and to offset deforestation elsewhere in the world.[62]

The actions to be proposed by the Committee to achieve a 20 per cent reduction in carbon dioxide emissions by 2005 include the following:

- restructuring the local electricity distribution utility – which is partly under the control of City Council – as an electricity service company concerned with meeting electricity service needs at the lowest possible environmental cost

- intervention in the activities of the private natural-gas distribution company, through its provincial regulatory agency, to achieve more widespread use of natural gas – instead of electricity, gasoline, and heating oil – and more efficient use of the fuel

- support for a denser, more variegated urban form

- early work to expand district heating and introduce district cooling

- reducing the energy used in public and private buildings

- aggressive favouring of public transit over other vehicles when roads are shared

- extensive tree planting, not only to create the carbon sink discussed above but also as a means of reducing energy use through shading and sheltering.

Implementation of most of what the Special Advisory Committee is poised to propose will depend on actions by other governments and agencies that presently show little inclination to treat the issue of global warming with much seriousness. A telling point will be the extent to which the forthcoming strategic plan of the Metropolitan Toronto Council – which has substantial responsibility for regional planning, major roads, and public transit – will concern itself with contributing to the prevention of global warming.

Even more significant will be support and complementary action by the newly elected provincial government, whose platform and early actions have promised strong action to protect the environment but which has yet to show concern to prevent global warming.

Toronto has been described as "that brave archetype of our times" – largely on account of its being settled by "half the world, it often seems" and "most of contemporary humanity's aspirations."[63] Humanity is far from aspiring to avoid its own demise on an overheated planet. The prototype for preventive action that may be emerging in Toronto deserves careful nurturing and support.

CONCLUDING COMMENTS

This cursory review suggests that local government and its agencies in five large North American urban areas are little touched by the profound dangers to human existence posed by the continued release into the atmosphere of radiatively active gases. The technical sophistication of the Los Angeles region's South Coast Air Quality Management District and the political commitment of Toronto City Council shine as beacons in a landscape of institutional indifference, but even their illumination promises much less action than is required to avert catastrophe.

What follow are six kinds of explanation for the apparent unwillingness to act, and comments on the explanations:

- *Local government is merely reflecting the widespread ignorance and confusion about the ongoing enhancement of the greenhouse effect by human activity and about the likely effects of global warming.* The fog of constructed controversy that underlies this explanation is lifting as the evidence that something is wrong with the global climate becomes clear.

- *Local government is aware that our present way of living may be unsustainable, but the economic, social, and political costs of achieving change make it too unpalatable for serious consideration.* Here local government reflects what may be a profound selfishness in our society, in which people say they must drive their automobiles even if it means that their grandchildren's lives will be shortened. Often faith in technology is used to buttress inaction: "surely a non-polluting fuel will be found."

- *Even when elements of local government are aware of the dangers and convinced of the need for action, the issues are defined as global and therefore the responsibility of national or other governments rather than*

local governments. This explanation is not specific to the particular danger of global warming. It is part of the general avoidance of responsibility that infuses contemporary government in North America, particularly responsibility for the welfare of generations to come.

- *Even when global thinking is allowed to inspire local action, there is unwillingness to tamper with the essentials of North American existence, notably the automobile and the detached suburban home, and the profound dependence of the economy on these essentials.* The question here is whether government should leave people to find out for themselves that automobile-based, low-density settlement becomes increasingly untenable – as is already happening in the Chicago and Los Angeles regions – or should take what may be unpopular preventive action to ensure that large numbers of a region's residents are not left isolated when unfettered use of fossil fuels is no longer acceptable or possible.

- *Even when there is willingness to act, the willingness is diffused by awareness of more pressing concerns, such as recession, new taxes, and the threat of war in the Persian Gulf.* Pressing events usually crowd out future considerations, but this may be less likely to happen if part of an educational process about global warming includes development of awareness that our failures to address important environmental issues are partly the causes of recession, taxes, and the prospect of war.

- *There is ambivalence about cities, which often appear to be sources of environmental degradation rather than solutions to it, an appearance that may keep urban leaders away from environmental controversy in case they become the objects of criticism.* This last possible explanation deserves a fuller comment that is set out in the next few paragraphs.

Cities are sources of environmental degradation simply because the degradation is a product of human activity and because human activity is concentrated in cities. The question to ask is whether the people in a city would cause more or less degradation if they were scattered in low-density developments.

A recent analysis of settlement scenarios for the Toronto region for the years 2011 and 2021 showed convincingly that, other things being equal, a concentration scenario gives rise to less than half the degradation in atmospheric quality than a sprawl scenario.[64] Only transportation was considered in this analysis. Inclusion of fossil fuel uses in buildings and in industry would have added to the reduction in degradation indicated for a more compact urban form.

Even critics of compact urban development acknowledge that the environmental arguments against sprawl are convincing.[65]

In spite of two centuries of urbanization, many North Americans hold strongly to the belief that city living is not the proper fate of humanity but a temporary condition to be endured for economic reasons while resources are marshalled that will enable a return to the land.[66] Some environmentalists reinforce prejudices against the city, particularly the large city, by holding up the rural way of living and its small-town correlates as ideal. For example, here is part of a submission to the World Commission on Environment and Development (the Brundtland Commission):

> "Large cities by definition are centralized, man-made environments that depend mainly on food, water, energy, and other goods from outside. Smaller cities, by contrast, can be the heart of community-based development and provide services to the surrounding countryside."[67]

But whether there are enough sites to house present and anticipated world populations in such smaller cities has not been demonstrated.

The reality today is that people who want a rural ambience usually also want the access to a wide range of people, goods, and services that can be provided at low energy cost only in a large city. Providing this degree of amenity to exurban residents inevitably involves unsustainable levels of energy use.

Large cities, managed so that their residents are responsible for the consumption per capita only one tenth of the present use of fossil fuels in industrialized countries, are probably an essential form of settlement to accommodate the world's billions of people while preventing further global warming. Thus the ability of large cities in today's industrialized countries to reduce their dependence on fossil fuels is a matter of profound concern. The present indifference to such global concerns found in several North American urban regions does not provide cause for optimism.

* * * * *

NOTES

Publicly available sources mentioned in these notes (other than newspapers) appear in a list beginning on Page 26. Here they are referred to by author or title and the actual page number in the source on which the information or other cited material appears, e.g., Leggett (p43).

[1]This paper is based on a presentation to Metropolis '90, the triennial meeting of the World Association of the Major Metropolises, held in Melbourne, Australia, October 15-19, 1990. The paper was completed in December, 1990.

[2]The author serves as a member of the Metropolitan Toronto Council and as president of the Canadian Urban Institute. He can be reached at 390 Bay Street, Suite 302, Toronto M5H 3Y7, Canada. Tel. (416) 392-4067; Fax (416) 392-4121.

[3]The Second World Climate Conference was held in Geneva, Switzerland, from October 30 to November 7, 1990.

[4]The report of Working Group 1 of the Intergovernmental Panel on Climate Change (IPCC), a panel established by the United Nations General Assembly in 1988. References here to the contents of the report are based on the description of it in Leggett (various pages).

[5]Leggett (p18). Leggett wrote that the "committed" warming due to emissions between 1880 and 1989 will occur "at some time in the future." The reference in Note 18 below to a conviction that global warming due to human activity has already started suggests that the phrase "during the next few decades" may now be more appropriate.

[6]The possibility that things will get too hot for life does not seem to have been discussed explicitly in the scientists' report. However, the logic of the report appears to lead to this conclusion. See also, for example, George M. Woodwell in Leggett (p131), who raises the possibility of runaway global warming. However, some scientists have dismissed the notion that human activity could precipitate a "runaway greenhouse effect as on Venus in which the oceans would boil away" (Schneider, p77). Gribbin (p254) argued "Even if the greenhouse effect proceeds so fast, and so far, that human society collapses under the strain, there will still be life on Earth and [thanks to Gaia] conditions may settle down to something resembling the climatically lop-sided but biologically flourishing planet of five to ten million years ago." Thus Gaia, the living skin of our planet, may be thought of as sacrificing humanity in order to survive.

[7]Leggett (p43) summarised the estimates of cuts required by the IPCC working group and the United States Environmental Protection Agency. The precise reduction of 70% for CO_2 comes from Mick Kelly in Leggett (p105).

[8]Specifically, from Mick Kelly in Leggett (p101-102).

[9]Stephen Schneider discussed this in Leggett (p58). See also the letter from L.D. Danny Harvey to the editor of the *Globe & Mail*, November 3, 1990.

[10]The data on CO_2 emissions are based on those in Lester Brown's chapter in Brown (p18), with carbon emissions converted to CO_2 emissions. According to information in White (p41), rates of increase in CO_2 from 1950 to 1980 were 2.7%, 5.0% and 7.1% for market (First World), command (Second World), and developing (Third World) economies, respectively.

[11]The full title of the 1988 Toronto Conference was The Changing Atmosphere: Implications for Global Security. It was sponsored by the Government of Canada. Its Action Plan for the Protection of the Atmosphere included the following: "Reduce carbon dioxide emissions by approximately 20 percent of 1988 levels by the year 2005 as an initial global goal."

[12]These data are based on the population trends illustrated in *Our Common Future* (p100).

[13]Anonymous official quoted in Leggett (p9).

[14]Data in Davis (p59) indicate that the proportions of primary uses of fossil fuel energy (i.e., excluding hydropower, nuclear, and traditional sources) devoted to transportation, industry, and residential/commercial purposes world-wide were 23, 42, and 35 per cent respectively in 1985. Data in Gibbons et al. (p142) suggest that proportions of primary uses of fossil fuel energy devoted to residential, industrial, and commercial purposes in the United States were 36, 36, and 28 per cent respectively in 1987. Where energy used in commercial buildings is accounted for in the latter analysis is unclear. Beverington and Rosenfeld (p79) gave values for residential [17 exajoules] and commercial [13 exajoules] that suggest they are both represented in the "residential" category in Gibbons et al..

[15]According to Tom Parkinson, in a paper presented at the Globe 90 Conference, Vancouver BC, March 1990, "the automobile consumes four times the energy per passenger-kilometre of the four-axle diesel bus and eight times that of electric rail vehicles. In the peak period ... the diesel bus becomes six times more efficient while electric rail transit becomes 15 times more efficient [than the automobile]. " Parkinson also noted that highway construction requires between three and eight times more energy than construction of a rapid transit system with an equivalent carrying capacity, and that automobile manufacture requires 2.5 to 6 times more energy. (Parkinson's data came from a 1990 study by British Columbia Transit.) In Table 3 (on the next page), Parkinson's estimates of energy use by transportation mode are compared with those of Peter Hughes of the Open University, UK, in a paper given at the Universities Transport Studies Group Conference, 1990, based on many sources, and those cited in the 1990 brief by the Canadian Urban Transit Association entitled "The Environmental Benefits of Urban Transit," which were based on a 1983 report of the Ontario Ministry of Transportation and Communications.

A paper presented by Jean-Luc Roux of the Fondation Roi Baudouin, Brussels, Belgium, at the World Congress of Local Governments for a Sustainable Future held at the United Nations Headquarters, New York, in September 1990, suggested that gasoline use releases 70 grams of CO_2 per megajoule and the use of electricity when generated using fossil fuels accounts for the release of 78 grams per megajoule. Thus multiplying the numbers in the next-to-last column of Table 3 (on the next page) by 75 gives the approximate number of grams of CO_2 emitted per person-kilometre for each mode.

Table 3. Estimates of energy consumption of different modes of transportation.

Mode (number of persons per vehicle)	Direct energy consumption in megajoules per person-kilometre in typical use*				Ratio to trolley-bus use
	Parkinson	Hughes	CUTA	Average of estimates	
Automobile (1.5)	3.07	3.10	4.49	3.55	17.8
Boeing 737 (100)		2.43		2.43	12.2
Commuter rail (160)	0.52	0.49	0.58	0.53	2.7
Diesel bus (40)	0.48	0.35	0.47	0.43	2.2
Streetcar (52)			0.37	0.37	1.9
Trolley bus (40)	0.16		0.24	0.20	1.0

*These estimates are not clearly enough specified as to (i) inclusion or not of the energy used in the manufacture of vehicles, which typically amounts to the equivalent of some 15 per cent of the lifetime gasoline use in a private automobile according to information in *The Canadian Green Consumer Guide* (p118), and (ii) the energy used in the production of the fuel, which gives rise to emissions of CO_2 equal to some 48 per cent of emissions during use of gasoline and 28 per cent of emissions during use of diesel fuel according to information in *Global Warming and Stratospheric Ozone Depletion* (p3-7).

[16]Ross and Steinmeyer (p94) mentioned several ways in which the energy consumption of particular industrial processes could be reduced by 30% or so. Amory Lovins, in his chapter in Leggett (p201), showed how 75% or more of all electricity and 80% or more of all oil use in the US could be saved through no-cost or low-cost measures to improve efficiency. Substitution of non-renewable for renewable energy could lead to greater reductions in fossil fuel use in industry. In the November 1990 draft of the second report of the City of Toronto's Special Committee on the Environment (see Note 62), reference is made to the following rates of carbon emission (as carbon dioxide – in kilograms of carbon per tonne of steel) during the manufacture of steel: present mills using iron ore – 498; advanced mills using iron ore – 252; present mills using scrap metal – 114; advanced mills using scrap metal 50.

[17]According to Bevington and Rosenfeld (p77-86), the energy efficiency of buildings in the United States could readily be doubled by 2010. Super-insulation of homes can reduce the fuel bills of homes by almost 90%. In the same issue, Fickett and colleagues (p67) show how reductions of 90% or more can be achieved in energy use for lighting and 70% or more in energy use for electric motors. These observations only concern efficiency of use of non-renewable energy. Greater reductions in fossil-fuel use are possible through substitution of renewable for non-renewable energy and through design features such as planting trees and avoiding large areas of asphalt.

[18]Leggett (p18) wrote of doubt as to whether the increase in the average global temperature of 0.3-0.6°C since pre-industrial times is due to human activity. David Suzuki, in his column in the *Toronto Star* on November 24, 1990, wrote that "At the end of the scientific and technical

sessions of the Second World Climate Conference in Geneva this month, more than 700 of some of the world's leading experts confirmed global temperatures are rising as a result of human activity." But see also the report in the same newspaper (December 2, pB8) on the first meeting of the World Meteorological Organization's Climate Change Detection Project, in Niagara-on-the-Lake, Ontario. Kirk Dawson, director-general of the Canadian Climate Centre was reported as saying "The climate is clearly changing and scientists must be able to determine whether it's due to the world's natural variability or to the greenhouse effect. ... Natural forces – volcanic eruptions, variations in the sun's energy, and changes in the Earth's orbit – ... can lead to warming trends that must be distinguished from warming due to the greenhouse effect."

[19]Both matters – 1990 as the hottest year and the bleaching of coral reefs – were before the US Senate Committee on Commerce, Science, and Transportation on October 11, 1990 (*Washington Post*, October 12, 1990; see also *Toronto Star*, December 29, 1990, pD6). Another recently reported manifestation of warming has been the disappearance of Arctic ice during successive warm summers in 1988, 1989, and 1990, when deep-sea temperatures have been as high as 11°C rather than the usual 2.5°C. Alaskan wildlife official, Benjamin Negeak, was reported to have said, "Huge ice floes that used to break free in July, swirl far out to sea and be driven back on the currents to rejoin the main pack in October, have simply drifted out to sea and melted." (*Toronto Sun*, December 4, 1990).

[20]Leggett (p128)

[21]Mick Kelly in Gordon and Suzuki (p86)

[22]Gribbin (p209)

[23]According to Boyle and Ardill (p56), "there will be severe adverse effects in the east and south, balanced by improved growing conditions in the north and west. The [United States] would be able to go on meeting its own food needs, even under the most extreme conditions predicted."

[24]*Chicago Tribune*, February 18, 19, 20, 21, 22, and 23, 1990 – with an editorial comment on February 25.

[25]By Lawrence Christmas, Executive Director of the Northeast Illinois Planning Commission, July 9, 1990.

[26]Respectively, Joe Ligas, Deputy Executive Director for operations planning, Chicago Area Transportation Study, July 9, 1990, and Lawrence Christmas (see previous note).

[27]Fred Deters, City Planner, Department of Planning, City of Chicago, July 10, 1990. The population density of the City of Chicago is about 5,150 persons per square kilometre, considerable more than that of Metropolitan Toronto, which has an almost identical area .

[28]At a symposium in Toronto entitled Planning the Toronto Region: Lessons from Other Places, October 31-November 1, 1990, organized by the Canadian Urban Institute.

[29]Deane Dana, Supervisor, Los Angeles County, had nothing but bad words for the arrogance of the agency and complaints about the extent of its inference in people's lives, in Melbourne, Australia, on October 22, 1990.

[30]David Rutherford, Public Relations Officer for the South Coast Air Quality Management District, October 1, 1990.

[31]David Rutherford – see previous note. Also, an article in the *New York Times* (August 17, 1990, pA10) indicated that the Los Angeles region was in violation of the federal guideline of 0.12 parts per million of ozone on an average of 134.5 days per year during the three years 1987-1989. The averages for the next five highest communities were 44.2 (Bakersfield, Ca.), 24.3 (Fresno, Ca.), 17.4 (New York), 15.8 (Sacramento, Ca.), and 13.0 (Chicago).

[32]Wayne Barsekowski, SCAQMD official, October 1, 1990

[33]Figure from David Rutherford – see earlier note.

[34]According to Mick Kelly in Leggett (p86), CFC-11 and CFC-12 together accounted for 14 per cent of the world-wide total emission of greenhouse gases (in CO_2 equivalents) from human activity in the 1980s; CO_2 itself accounted for 49%. But, such are the relative rates of increase in emissions, the potencies, and the dwell times in the atmosphere, under a business-as-usual scenario the contributions of CFCs to global warming will increase by 62 and 74 per cent respectively during the period 1990-2059, while the contribution of CO_2 will increase by only 37 per cent.

[35]According to a brief review in *Global Warming and Stratospheric Ozone Depletion* (p2-12).

[36]Letter to the author from Lillian Y. Kawasaki, General Manager, Department of Environmental Affairs, City of Los Angeles, September 6, 1990.

[37]*Air Quality Management Plan* (p4-19)

[38]Jack Broadbent, Planning Manager, SCAQMD, October 1, 1990.

[39]This and much of the information that follows on the Los Angeles region was provided by Arun N. Naik, Senior Planner and Paul H. Hatanaka, Principal, Environmental Planning, at the offices of the Southern California Association of Governments (SCAG), October 2, 1990. The current rate of growth in population, according to these officials, is 7 per cent a year. Continuation of it at this rate would take the regional population to above 50 million by 2010. Another source (*Downtown News*, October 1, 1990, pA10 – based on data from the Traffic Management Association) suggests that the vehicle population is rising at a higher rate than the human population, and that traffic is increasing at an even higher rate.)

[40]*Air Quality Management Plan*, (p4-33 to 4-35).

[41]Arnold I. Sherwood, Director, Community and Economic Development, SCAG, October 2, 1990.

[42]The final call for action of the 1988 Toronto conference on The Changing Atmosphere included a statement that "... the desired reduction [in CO_2 levels] will require ... revisiting the nuclear power option ... [which] could have a role to play in lowering carbon dioxide emissions." To replace half the petroleum used for transportation in the United States with electricity from nuclear-powered generating stations would require construction of more than 170 1,000-megawatt nuclear reactors – i.e., construction of more than ten reactors a year between now and 2007. This estimate is based on data in Gibbons et al. (p142), which

indicates that oil presently provides 3.25 times the primary energy supplied by nuclear power installations in the United States, and in Häfele (p138), which indicates that the present installed capacity in the United States is equivalent to some 98 1,000-megawatt reactors. Line and conversion losses are not taken into account.

[43]Globe & Mail, September 29, 1990, pD3.

[44]*Le Répertoire des Initiatives Environmentales* (whole document).

[45]Natural gas is a cleaner burning vehicle fuel than gasoline. It also produces about a third less CO_2 per unit of energy released (Oppenheimer and Boyle, p24), although some of this benefit is lost on account of the energy used to carry around the heavy tanks required to hold the gas under pressure. The problem is that natural gas – i.e., methane – is a greenhouse gas, 30 times as potent as CO_2 (Boyle and Ardill, p28). Ideally, none leaks. In practice, substantial amounts leak during the processes of extraction and transport of the gas – some 10 per cent, according to Francesca Lyman et al. (p91). An even higher proportion may leak during the fuelling of vehicles and during their operation. Thus use of natural gas as a vehicle fuel could add to global warming.

[46]From the *MUC's Development Plan* (1988).

[47]The Census Metropolitan Area of Montreal grew in population from 2.75 to 2.90 million between 1971 and 1986; that of the Montreal Urban Community fell from 1.95 to 1.75 during the same period. These data were taken from the *Canadian World Almanac*, and the *MUC's Development Plan*.

[48]André Gamache, Secretary-General, Montreal Urban Community, telephone conversation in August, 1990.

[49]Information from Cathy Alsandre of Lt.-Gov. Stan Aldine's office, August 21, 1990.

[50]The World Congress of Local Governments for a Sustainable Future, September 5-8, 1990.

[51]New York Times, September 7, 1990.

[52]See Note 45.

[53]Dr. Jerry Schubel, August 14, 1990.

[54]Leggett (p9).

[55]The City of Toronto – population 620,000 – is the capital of the province of Ontario and the oldest part and business and cultural centre of the Toronto region, which has a population of some 4 million. It is one of six cities that comprise Metropolitan Toronto – population 2.25 million – which has a separately elected council whose administration provides regional services for the area of the six cities. Thus "Toronto" can mean the City, the metropolitan area or the region.

[56]Also see Note 11.

[57]Local government in Canada is weak, as has been noted often (e.g., Gilbert, p11-13). Within the Toronto region (see Note 55), authority over matters that might contribute to the prevention of global warming is largely elsewhere than with the City of Toronto Council – mostly with the government of Ontario, but also with the federal government and the regional government (the Metropolitan Toronto Council). Nevertheless, Toronto City Council can have considerable influence – much of it on account of the attention paid by the media to the council's actions.

[58]This concept, known as Freecool, is most associated with Robert B. Tamblyn of Engineering Interface Ltd., North York, Ontario. Below a depth of 80 metres, the water of Lake Ontario is permanently at 4°C. A tunnel, six-kilometres long and three metres in diameter, could be used to draw water to a district cooling network at one twelfth of the energy cost of achieving an equivalent about of cooling using conventional electrical chillers. Moreover, present chillers use CFCs as the coolant and substantial amounts leak each year thereby adding to the enhanced greenhouse effect. The deep lakewater remains cold because it is renewed each winter by dense chilled water that sinks from the lake's surface.

[59]The City of Toronto's Energy Efficiency Office was established with a staff of five in July 1990 and instructed to focus initially on securing reductions in energy use in residential, commercial, and institutional buildings.

[60]The primary purpose of the August 1991 conference will be to provide a means for municipal leaders in many countries to have an impact on the deliberations of the United Nations Conference on the Environment and Development (UNCED), to be held in Rio de Janeiro, Brazil, in June 1992. The August 1991 conference is to be the first of two UNCED-related meetings in Toronto. The second, which will likely be held in June 1993, will provide an evaluation of UNCED from a local government perspective.

[61]The actual amount of coolant recovered, according to a report dated November 28 by the Commissioner of Public Works and the Environment, was approximately 3 kilograms. This compares with an estimated 90,000 kilograms of coolant that leaks from electrical chillers in commercial buildings in downtown Toronto each year – according to a footnote in the November 30 draft of the second report of the City of Toronto's Special Advisory Committee on the Environment.

[62]Draft of the second report of the City of Toronto's Special Advisory Committee on the Environment, November 1990.

[63]Jan Morris in her preface to Kluckner (p8).

[64]*Greater Toronto Area Urban Structure Concepts Study* (vol. 5, exhibit 6).

[65]See, for example, Audirac et al. (p470) who question the State of Florida's land-use policy, whose all-encompassing vision, according to these authors, is to redirect future growth to a more compact urban form. Their chief criticisms of high-density living are that it is not what most people want and that it may reduce water quality by exceeding the "carrying capacity of the land" (p477). Their analysis does not consider atmospheric pollution caused by use of fossil fuels and by release of CFCs from automobile air-conditioners.

[66]Audirac et al. (p473) noted that a rural ambience is among the most prominent reasons for choosing a suburban or exurban residential location. They continue, "According to urban

historians, these preferences are deeply rooted in a long-standing Anglo-America vision of the ideal middle class home, of family life in union with nature ..."

[67]By the Global Tomorrow Coalition, May 1986, quoted in *Our Common Future* (p243).

*****

SOURCES CITED IN THE NOTES

Air Quality Management Plan, 1989: South Coast Air Basin. South Coast Air Quality Management District, Los Angeles, and Southern California Association of Governments, Los Angeles, 1989.

Audirac, Ivonne; Shermyen, Anne H; and Smith, Marc T. Ideal urban form and visions of the good life: Florida's growth management dilemma. *Journal of the American Planning Association,* Autumn 1990, 470-482.

Bevington, Rick, and Rosenfeld, Arthur H. Energy for buildings and homes. *Scientific American,* September 1990, 77-86.

Boyle, Stewart, and Ardill, John. *The Greenhouse Effect: A Practical Guide to the World's Changing Climate.* Hodder and Stoughton, London, 1989.

Canadian World Almanac & Book of Facts 1991, Global Press, Toronto, 1990

Davis, Ged R. Energy for planet Earth. *Scientific American,* September 1990, 55-62.

Fickett, Arnold; Gellings, Clark W.; and Lovins, Amory B. Efficient use of electricity. *Scientific American,* September 1990, 64-74.

Gibbons, John H.; Blair, Peter D.; and Gwin, Holly L., Strategies for energy use. *Scientific American,* September 1989, 136-143.

Gilbert, Richard. The decline of the Canadian municipality. *Plan Canada,* January 1989, 11-13.

Global Warming and Stratospheric Ozone Depletion: Informational Report for Policy Development. Planning Division, South Coast Air Quality Management District, 1989.

Gordon, Anita, and Suzuki, David. *It's a Matter of Survival.* Stoddart, Toronto, 1990.

Greater Toronto Area Urban Structure Concepts Study. Prepared for the Greater Toronto Coordinating Committee, Government of Ontario, by the IBI Group and Associates, Toronto, 1990. (Summary and eight volumes)

Gribbin, John. *Hothouse Earth: The Greenhouse Effect and Gaia.* Grove Weidenfeld, New York, 1990.

Häfele, Wolf. Energy from nuclear power. *Scientific American,* September 1990, 136-144.

Kluckner, Michael. *Toronto: The Way It Was.* Whitecap Books, Toronto, 1988.

Le Répertoire des Initiatives Environmentales. Ville de Montréal, Service de la planification et concertation, April 1990.

Leggett, Jeremy (ed.) *Global Warming: the Greenpeace Report.* Oxford University Press, New York, 1990.

Lyman, Francesca (with Irving Mintzer, Kathleen Courrier, and James MacKenzie) *The Greenhouse Trap.* Beacon Press, Boston, Mass., 1990

Montreal Urban Community, Development Plan, Summary, Communauté Urbaine de Montréal, Service de la planification du territoire, 1988.

Oppenheimer, Michael, and Boyle, Robert H. Dead Heat: The Race against the Greenhouse Effect. Basic Books, New York, 1990.

Our Common Future. Report of the World Commission on Environment and Development (The Bruntland Report). Oxford University Press, New York, 1987

Ross, Marc H., and Steinmeyer, Daniel. Energy for Industry. *Scientific American,* September 1990, 88-98.

Schneider, Stephen H. *Global Warming: Are we entering the Greenhouse Century?* Sierra Club Books, San Francisco, 1989.

The Canadian Green Consumer Guide, McClelland & Stewart, Toronto, 1989.

White, Robert M. The great climate debate. *Scientific American,* July 1990, 36-43.

* * * * *

Canadian Urban Institute

Publications Available in the *Urban Focus Series*

90-1 Managing Regional Urban Growth I: Annotated Bibliography
ISSN: 1183-2304 ISBN: 1-895446-00-7 70pp. $15

The literature on the growth of urban regions includes thousands of articles in many periodicals and books. This annotated bibliography includes some 300 selected publications on regional policies and their economic, social, and political implications. Urban regions in North America, Western Europe, and Australia are covered.

90-2 Managing Regional Urban Growth II: Review of Government Documents
ISSN: 1183-2304 ISBN: 1-895446-02-3 40pp. $10

The second part of the annotated bibliography covers government documents from 17 urban regions in North America, Western Europe, and Australia.

90-3 MRUG: Managing Regional Urban Growth
ISSN: 1183-2304 ISBN: 1-895446-04-X Two 3½-inch 1.44 MB disks (MS-DOS only) $50

This is a computerized database version of the annotated bibliographies on managing regional urban growth listed above (i.e., 90-1 and 90-2). The database is supplied with its own software to query and print documents in the database. The database will be updated annually at cost of $25 per year to continuing subscribers.

90-4 Aspects of Local Government in Japan
ISSN: 1183-2304 ISBN: 1-895446-06-6 51pp. $10

This report touches on many aspects of local government in Japan but focuses on waste management, regional planning, and transportation in Nagoya and Tokyo, the third-largest and largest urban regions. The report is based on examination of English-language documents and extensive consultation with Japanese officials.

90-5 Metropolitan Toronto and Metropolitan Istanbul: A Comparison
ISSN: 1183-2304 ISBN: 1-895446-08-2 25pp. $5

The Republic of Turkey initiated a significant local government reform in the 1980s. As part of this reform, metropolitan governments were created in Istanbul, Ankara, Izmir, and Adana based on the system in place in Toronto. This is a brief comparative study of the metropolitan governments of Istanbul and Toronto and the challenges that face them.

90-6 Housing Intensification: Policies, Constraints, and Options
ISSN: 1183-2304 ISBN: 1-895446-10-4 56pp. $10

Housing intensification—residential development of a site at a density that is substantially higher than previously existed or was designated for the site—became a major policy option in the 1980s in many Canadian urban regions, particularly in the Greater Toronto Area. This study provides an overview of government policies, constraints on, and options for housing intensification in the GTA and, briefly, in Canada and elsewhere.

90-7 Housing Two Million More in the Greater Toronto Area by 2021
ISSN: 1183-2304 ISBN: 1-895446-12-0 63pp. $15

The product of a charrette—an architectural term referring to a study or a project performed within the framework of a tight deadline—organized by the Canadian Urban Institute. The charrette explored aspects of how the six million people anticipated in the Greater Toronto Area in 2021 (the present population is four million) might be housed without causing further urban sprawl. It brought together some ninety architects, planners, academics, and policy makers over three days to address issues of housing intensification and to develop specific proposals for possible application in the Greater Toronto Area.

90-8 The Changing Canadian Metropolis: Social Policy Challenge
ISSN: 1183-2304 ISBN: 1-895446-14-7 30pp. $10

The summary of a colloquium organized by the Canadian Urban Institute that brought together a Canada-wide group of public-sector professionals and academics. The colloquium addressed questions about urban social issues ranging from major challenges in the delivery of social programs in the 1990s to methods of integrating social and economic issues in Canadian metropolitan areas.

90-9 Lessons From Other Places: Planning the Toronto Region
ISSN: 1183-2304 ISBN: 1-895446-16-3 117pp. $20

The proceedings of a symposium organized by the Canadian Urban Institute for the provincial government's Office of the Greater Toronto Area. It brought together academics, researchers, and policy-makers from Chicago, Frankfurt, Melbourne, Paris, the Randstad, and San Francisco to outline the challenges faced by their urban regions. Peter Hall delivered a keynote address that set an international context for dealing with the challenges of regional planning and management in the Greater Toronto Area.

90-10 Metro in Transition

ISSN: 1183-2304 ISBN: 1-895446-18-X 80pp. $15

Prepared for the Community Services Department, Metropolitan Toronto, this research paper examines current trends in demographics and public policy and their implications for social programs. It also examines the economic trends that will affect social policies, such as unemployment, growth in the service sector, and increasing competition within the world economy.

Canadian Urban Institute Working Papers

Working papers are available without charge when single copies are ordered. For multiple copies please enquire.

WP-1 The Greater Toronto Area: An Urban Region

The Greater Toronto Area (Metropolitan Toronto and the four surrounding regional municipalities of Durham, Halton, Peel, and York) is an urban region comprising 30 local and five regional municipalities. This paper briefly describes the geographic, governmental, demographic, and economic characteristics of this urban region and the challenges it faces.

WP-2 Urban Environmental Policy Options

Prepared for the Federation of Canadian Municipalities to assist with the preparation of an environmental policy statement.

WP-3 Activities Related to the Prevention of Climatic Change in Some Major Urban Areas of North America

This paper sets out the need for action and the consequences of inaction, and then describes what is happening (or not happening) to prevent and prepare for global warming in Chicago, Los Angeles, Montreal, New York, and Toronto.

Send orders to the Canadian Urban Institute, 2nd Floor, West Tower, City Hall, Toronto, Ontario M5H 2N1. Or fax (416) 392-4583. Please use the order form attached.

Publications Order Form

INSTITUTE
CANADIAN URBAN
L'INSTITUT URBAIN
DU CANADA

2nd Floor West Tower
City Hall, Toronto
Ontario, M5H 2N1
Tel: (416) 392-0082
Fax: (416) 392-4583

Date: _____

Name: _____

Organization: _____

Position or Title: _____

Address: _____

City: _____ Province/State: _____ Country: _____

Postal Code/Zip: _____ Telephone: _____ Fax: _____

Publication No.	Title	Price	Quantity	Cost
			Add Shipping and Handling *	
			Canadian orders add GST@ 7%	
			SUBTOTAL	
			TOTAL	

Payment Enclosed ☐ (Cheque or money order payable to the Canadian Urban Institute).

Or bill my ☐ Visa ☐ American Express

Name of Cardholder (please print) _____

Card Number expiry date _____

Signature of Cardholder _____

Prices are subject to change.
* Within Canada add $1 per copy up to $4.
Outside Canada add $2 per copy up to $
Please allow 4 to 6 weeks for delive

GST Number R121844419